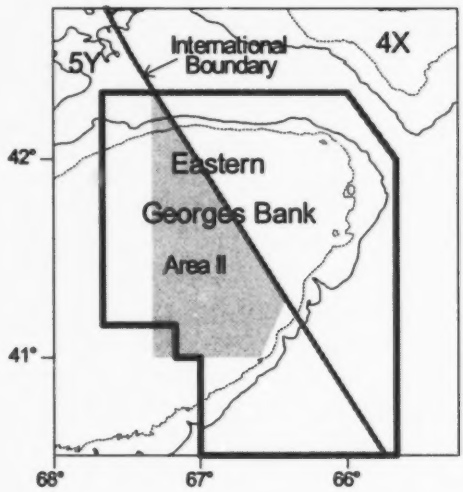
Fisheries and Oceans Canada | Pêches et Océans Canada | NOAA FISHERIES

Transboundary Resource Assessment Committee

Status Report 2006/04

EASTERN GEORGES BANK COD

[5Zjm; 551,552,561,562]



Summary

- Combined Canada/USA catches in 2005 were 1,200 mt, including 407 mt of discards.
- Adult population biomass (ages 3+) declined from 43,500 mt in 1990 to 8,500 mt in 1995, subsequently increased to 18,000 mt in 2001 and was 16,300 mt at the beginning of 2006.
- Recruitment at age 1 of the 2003 year class, at 7.9 million, is the first above average cohort since the 1990 year class. The 2002 and 2004 year classes, at less than 1 million each, are the lowest on record.
- **Fishing mortality for ages 4-6** increased sharply between 1989 and 1993 from 0.5 to 1.0. In 1995, fishing mortality declined to F_{ref}=0.18 but subsequently fluctuated above F_{ref} until 2004 when it declined to 0.17 and declined further in 2005 to 0.10.
- Resource productivity is currently poor due to declines in weight at age and generally low recruit per spawner.
- Assuming a 2006 catch equal to the 1,700 mt total quota, a combined Canada/USA catch of 2,900 mt in 2007 would result in a neutral risk (50%) that the fishing mortality rate in 2007 will exceed F_{ref}=0.18. A catch of 1,500 mt in 2007 would result in a neutral risk (50%) that the adult biomass would decrease from 2007 to 2008 and maintains the fishing mortality near F_{2005}=0.1.

Ce document est disponible sur l'Internet à : This document is available on the Internet at :
http://www.mar.dfo-mpo.gc.ca/science/TRAC/trac.html

Canada

July 2006

Catches, Biomass (thousands mt); Recruits (millions)

		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Avg[1]	Min[1]	Max[1]
Canada	Quota	3.0	1.9	1.8	1.6	2.1	1.2	1.3	1.0	0.7	1.3			
	Landed	2.9	1.9	1.8	1.6	2.1	1.3	1.3	1.1	0.6		6.8	0.6	17.8
	Discard	0.5	0.4	0.4	0.1	0.1	0.1	0.2	0.1	0.3		0.1	0.0	0.5
USA	Quota[3]								0.3	0.3	0.4			
	Landed	0.6	0.8	1.2	0.7	1.4	1.4	1.8	1.0	0.1		4.2	0.1	10.6
	Discard	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.2		0.0	0.0	0.2
Total	Quota								1.3	1.0	1.7			
	Catch	4.0	3.1	3.3	2.3	3.7	2.8	3.4	2.3	1.2		11.1	1.2	26.5
Adult Biomass[4]		13.7	11.8	14.6	15.2	18.1	17.4	15.3	17.1	11.5	16.3	24.6[2]	8.5[2]	43.5[2]
Age 1 Recruits		4.7	1.7	4.4	2.8	2.5	2.6	0.9	7.9	0.6		6.4	0.6	21.1
Fishing mortality[5]		0.51	0.34	0.30	0.19	0.32	0.23	0.33	0.17	0.10		0.47	0.10	1.03
Exploitation Rate		37%	26%	24%	16%	25%	19%	25%	15%	8%		33%	8%	59%

[1]1978 – 2005
[2]1978 – 2006
[3]for fishing year from May 1 – April 30
[4]Jan 1 ages 3+
[5]ages 4-6

Fishery

Combined Canada/USA catches, which averaged about 17,900 mt between 1978 and 1992, peaked at 26,500 mt in 1982, declined to 1,800 mt in 1995, fluctuated around 3,000 mt until 2003 and subsequently declined again. Catches in 2005 were 1,200 mt (Figure 1).

Canadian catches declined to 900 mt in 2005 from 1,300 mt in 2004. Since 1995, with reduction in cod quotas, the fishery has reduced targeting for cod through changes in fishing practices. All 2005 landings were subject to 100% dockside monitoring. As well, at sea observers monitored about 50% of landings (by weight) during January-February and 10% of landings during June-December. Analysis for the groundfish fishery indicated discards of 200 to 400 mt during 1997-1999 and 144 mt in 2005. Discards of cod by the Canadian scallop fishery since 1978 ranged up to 200 mt annually, and were 110 mt in 2005.

USA catches declined to 300 mt in 2005 from 1,100 mt in 2004. Since December 1994, a year-round closure of Area II has been in effect, with the exception of a Special Access Program in 2004. Minimum mesh sizes limits were increased in 1994, 1999 and in 2002. Limits on sea days, as well as trip limits, have also been implemented. Quotas were introduced in May 2004. Most of the 2005 catch was taken in the second and third quarters. Estimated discards of cod in the groundfish fishery for 1989-2004 were generally less than 100 mt annually but were 153 mt in 2005.

The 2001 year class at age 4 dominated (40% by number) the **combined Canada/USA 2005 fishery age composition**. The 2003 year class, although only partially recruited to the fishery at age 2, made the second highest contribution (17% by number) and was the

dominant year class discarded. The USA groundfish fishery cod discard catch at age for 1989-2005 and the Canadian groundfish fishery and scallop fishery cod discard catch at age for 1978-2005 were included in the assessment.

Harvest Strategy and Reference Points

The Transboundary Management Guidance Committee has adopted a strategy to maintain a low to neutral risk of exceeding the fishing mortality limit reference, $F_{ref} = 0.18$. When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.

State of Resource

The state of the resource was based on results from an age structured analytical assessment (VPA) that used fishery catch statistics and sampling for size and age composition of the catch for 1978 to 2005 (including discards). The VPA was calibrated to trends in abundance from three bottom trawl surveys series; NMFS spring, NMFS fall and DFO. Retrospective analyses were used to detect any patterns to consistently overestimate or underestimate fishing mortality, biomass and recruitment relative to the terminal year estimates. The extent of the pattern for this assessment was similar to that seen in the past and was not of concern.

Adult population biomass (ages 3+) declined substantially from 43,500 mt in 1990 to 8,500 mt in 1995, the lowest observed (Figure 2). The biomass subsequently increased to 18,000 mt in 2001, declined to 11,500 mt in 2005 but increased again to 16,300 mt at the beginning of 2006 (80% Confidence Interval: 14,300 mt – 21,200 mt). Much of the increase in the late 1990's was the result of growth and survival to ages 5+ of the 1992, 1995 and 1996 year classes. The increase in 2006 was due largely to recruitment of the 2003 year class. Lower weights-at-age in the population in recent years and the generally poor recruitment have contributed to the lack of rebuilding.

Recruitment at age 1 of the 2003 year class, at 7.9 million, is the first above average (6.4 million) cohort since the 1990 year class. Prior to the 2003 year class, the 1996 and 1998 year classes, at over 4 million, were the strongest since the 1990 year class (Figure 2). The 2002 and 2004 year classes, at less than 1 million each, are the lowest on record.

Fishing mortality for ages 4-6 increased sharply between 1989 and 1993 from 0.5 to 1.0 (Figure 1). In 1995, fishing mortality declined to F_{ref}=0.18, due to restrictive management measures, but subsequently fluctuated above F_{ref} until 2004 when it declined to 0.17 and declined further in 2005 to 0.10 (80% Confidence Interval: 0.08 – 0.13).

Productivity

Age structure, fish growth, recruits per spawner, and spatial distribution reflect changes in the productive potential. In both absolute numbers and percent composition, the **population age structure** displays a higher abundance at older age groups compared to

the mid 1990s. However, the abundance for older ages may not be well determined. Average weight at length, used to reflect **condition,** has been stable, but declines in **weight at age** have hampered biomass rebuilding. The **recruit per adult biomass ratio** has been generally lower than that seen prior to 1990, with the exception of the 2003 year class. The **spatial distribution** patterns observed during the most recent bottom trawl surveys were similar to the average patterns over the previous decade. Resource productivity potential is currently poor due to declines in weight at age and generally low recruit per spawner ratio.

Outlook

This outlook is provided in terms of consequences with respect to the harvest reference points for alternative catch quotas in 2007. Uncertainty about standing stock generates uncertainty in forecast results which is expressed here as the risk of exceeding F_{ref} =0.18. The risk calculations assist in evaluating the consequences of alternative catch quotas by providing a general measure of the uncertainties. However, they are dependent on the data and model assumptions and do not include uncertainty due to variations in weight at age, partial recruitment to the fishery, natural mortality, systematic errors in data reporting or the possibility that the model may not reflect stock dynamics closely enough.

For **projections**, the 2003-2005 average values were assumed for the fishery weight at age and partial recruitment pattern in 2006 and later and the 2004-2006 survey average values were assumed for beginning of year population weight at age in 2007 and later. Assuming a 2006 catch equal to the 1,700 mt total quota, a combined Canada/USA catch of 2,900 mt in 2007 would result in a neutral risk (50%) that the fishing mortality rate in 2007 will exceed F_{ref}. This results in a high risk (over 75%) that the 2008 adult biomass will be lower than the 2007 adult biomass. However, the magnitude of the biomass decline is nominal and not very well determined. A catch of about 1,500 mt in 2007 would result in a neutral risk (50%) that the adult biomass would decrease from 2007 to 2008 and maintains the fishing mortality near F_{2005}=0.1. The 2003 year class is projected to make a large contribution to the fishery over the next several years.

Medium term projections indicate declining yield as the above average 2003 year class is fished down. Exploitation below F_{ref} would maintain biomass at higher levels until better recruitment occurs. These results assume average recruitment of 2.5 million (1991 – 2004 year classes, excluding the 2003 year class) and constant fishing mortality rate of 0.18.

Biomass, Yield (thousands mt)

	Total Biomass	Adult Biomass[1]	Yield
2007	20	19	2.9
2008	20	19	2.6
2009	20	19	2.5
2010	19	18	2.4
2011	19	18	

[1]adult biomass (ages 3+) is considered a proxy for spawning stock biomass

Special Considerations

Consistent management by Canada and the USA is required to ensure that conservation objectives are not compromised.

The 2003 year class will dominate the catch in 2007 and continue to dominate until 2010, the last year of the forecast. The 2004 year class is weak and preliminary indications for the 2005 year class are not promising. The 2003 year class affords an opportunity to continue rebuilding of the stock by fishing below F_{ref}.

Cod and haddock are often caught together in groundfish fisheries, although their catchabilities to the fisheries differ and they are not necessarily caught in proportion to their relative abundance. With current fishing practices and catch ratios, the achievement of rebuilding objectives for cod may constrain the harvesting of haddock. Additional efforts are warranted to protect the 2003 cod year class which is the first above average year class since the 1990 year class. Due to the higher haddock quota, discarding of the 2003 cod year class may be high and should be monitored. Modifications to fishing gear and practices, with enhanced monitoring, may mitigate these concerns.

Source Documents

Gavaris, S., L. O'Brien, B. Hatt, and K. Clark. 2006. Assessment of Cod on Eastern Georges Bank. TRAC Reference Document 2006/(in prep.).

TRAC. 2006. Proceedings of the Transboundary Resource Assessment Committee (TRAC); 13–16 June 2006. TRAC Proceedings 2006/(in prep.).

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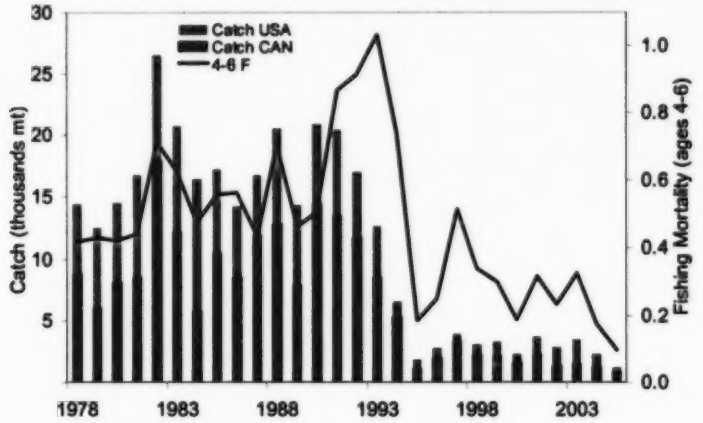

Figure 1. Catches and fishing mortality.

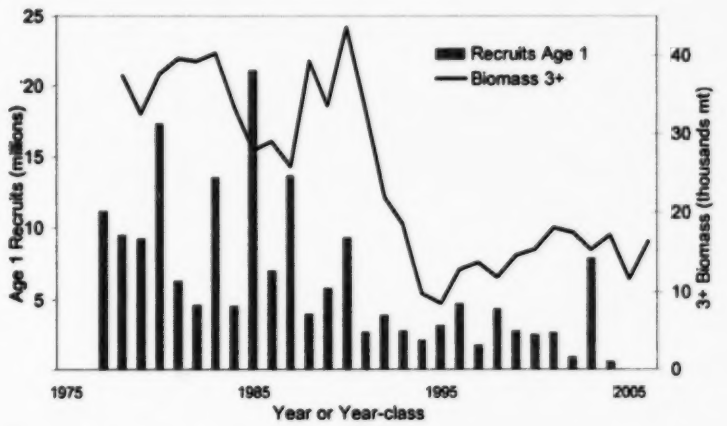

Figure 2. Biomass and recruitment.

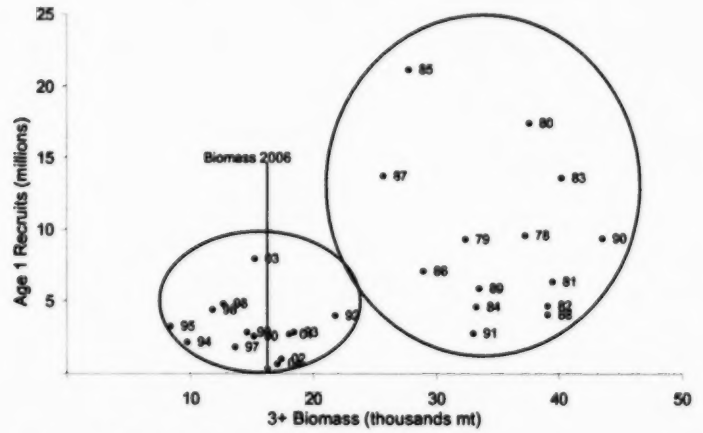

Figure 3. Stock recruitment patterns.

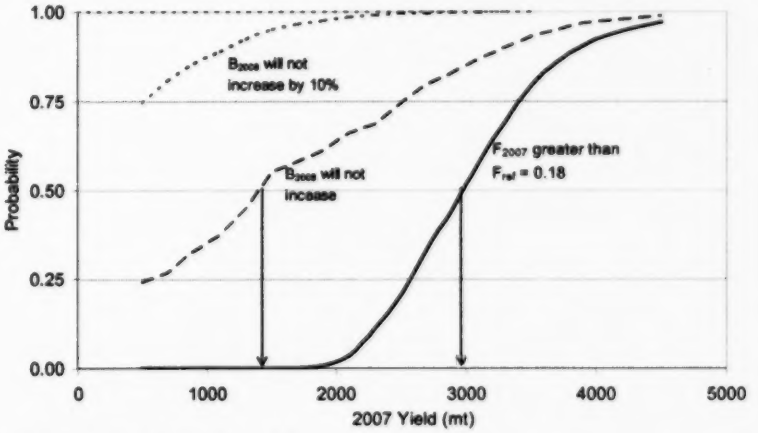

Figure 4. Projection risks.